2.3. AIR-TO-AIR RADAR TEST TECHNIQUES

2.3.1. Scan Rate

2.3.1.1. Purpose

The purpose of this test is to determine the average radar scan rate and its effect upon the utility of the radar presentation.

2.3.1.2. General

As outlined in the radar theory section, most airborne radars operate in a raster scan format. The rate at which the antenna moves from side to side determines the scan rate. Since the antenna must stop at each side and since all moving parts have some inertia, the actual scan rate varies through the scan and as the scan angle limits change. The crucial characteristic; however, is how often the sweep passes through the target's bearing and so an average scan rate over a number of scans is adequate for most purposes.[6] Scan rate can affect several radar performance factors. A quick scan rate is best to provide frequent updates of the target position, facilitating target tracking and pointing out trends in target bearing drift and range closure rate. Too quick of a scan; however, reduces the possible number of radar hits per scan for a given PRF, reducing pulse to pulse integration and thus the possibility of detection.

2.3.1.3. Instrumentation

A stop watch and data cards are required for this test. A voice recorder is optional.

2.3.1.4. Data Required

Measure the time for ten complete radar scans (one side to the other and back) at each scan angle limit setting. Record qualitative comments on the effects of scan rate upon radar detection, tracking and the maintenance of target SA.

2.3.1.5. Procedure

While on the ground, use a stop watch to measure the time for the sweep to move from one side of the display and back for ten full sweeps. Perform the test at all scan angle limit settings and repeat for one setting while airborne to confirm the ground test results. If a discrepancy occurs between the ground and airborne data, repeat for all scan angle limits. While performing mission relatable intercepts and attacks (preferably at the extremes of target closure rate and target crossing rate) qualitatively evaluate the effects of the average scan rate upon tracking, detection and the maintenance of SA. Check for all mission relatable combinations of scan angle limit and scan rate.

2.3.1.6. Data Analysis and Presentation

The average scan rate should be calculated using the following relationship:

$$Scan\ Rate = \frac{(Scan\ Angle\ Limit\ in\ deg)(20)}{(Time\ for\ 10\ Sweeps)} \qquad (7)$$

Relate problems with the target update rate to the calculated average scan rate. If tracking is not adequate, an unusually quick scan rate can be inferred as a possible cause; however, a definitive association will be beyond the scope of this test, requiring further instrumentation (tracking computer data extraction, recording and analysis).

2.3.1.7. Data Cards

A sample data card is presented as card 5.

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[6] In the context used here, the average scan rate is very similar to the update rate. The use of a multiple bar scan format can further affect this distinction.

CARD NUMBER ___   TIME ____   PRIORITY L/M/H

AIR-TO-AIR SCAN RATE

[RECORD TIME FOR 10 COMPLETE SCANS.]

RADAR MODE	SCAN ANGLE LIMIT	TIME FOR 10 SWEEPS

[RECORD SCAN RATE QUALITATIVE COMMENTS ON

TRACKING/DETECTION/SA.]

TARGET BEARING/RANGE ____/____

TARGET/TEST AIRPLANE COURSE ____/____

TARGET/TEST AIRPLANE SPEEDS ____/____

RADAR MODE_____

SCAN ANGLE LIMIT ____

EFFECTS:

Card 5: Air-to-Air Scan Rate Data Card